California Environmental Protection Agency
Air Resources Board

FACTS ABOUT

CALIFORNIA'S ACCOMPLISHMENTS IN REDUCING DIESEL PARTICULATE MATTER EMISSIONS

The identification of diesel particulate matter (PM) as a toxic air contaminant in 1998 led the California Air Resources Board (ARB) to adopt the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-fueled Engines and Vehicles* (Plan) in September 2000. The Plan's goals are a 75 percent reduction in diesel PM by 2010 and an 85 percent reduction by 2020 from the 2000 baseline. The following information gives a brief overview of the significant accomplishments made to date in reducing diesel PM.

Cleaner Diesel Fuel

California's diesel fuel is the least polluting in the nation. In 2003, the ARB adopted a new regulation lowering the sulfur content of diesel fuel to enable the use of advanced emission control technologies for diesel engines. The California diesel regulations for sulfur and aromatics are estimated to result in 25 percent less PM and about seven percent less oxides of nitrogen (NOx) emissions. Sulfur levels in diesel fuel will be lowered to less than 15 parts per million by July, 2006. California's rule applies to on-road, off-road, and stationary engines while the federal low sulfur diesel rule applies only to on-road vehicles. Meanwhile, some refiners in California are already making ultra-low sulfur diesel so it is available where needed. California transit agencies have been required

Why is ARB concerned about emissions from diesel engines?

Diesel engines emit a complex mixture of air pollutants, composed of gaseous and solid material. The visible emissions in diesel exhaust are known as particulate matter or PM, which includes carbon particles or "soot." Diesel exhaust also contains a variety of harmful gases and over 40 other cancer-causing substances. In 1998, California identified diesel PM as a toxic air contaminant based on its potential to cause cancer, premature deaths, and other health problems. Exposure to PM is a health hazard, particularly to children whose lungs are still developing and the elderly who may have other serious health problems. Each year in California, diesel PM contributes to an estimated 2,900 premature deaths, 3,600 hospital admissions, 240,000 asthma attacks and respiratory symptoms and 600,000 lost workdays. Overall, diesel engine emissions are responsible for the majority of California's potential airborne cancer risk from combustion sources.

to use ultra-low sulfur diesel since July 1, 2002.

Cleaner New Diesel Engines

Standards for New On-Road Diesel Engines

In 2001, ARB adopted new PM and NOx emission standards to clean up large diesel engines that power big-rig trucks, trash trucks, delivery vans and other large vehicles. The new standard for PM takes effect in 2007 and reduces emissions to 0.01 gram of PM per brake horsepower-hour (g/bhp-hr.) This is a 90 percent reduction from the existing PM standard. New engines will meet the 0.01 g/bhp-hr PM standard with the aid of diesel particulate filters that trap the PM before exhaust leaves the vehicle.

Standards for New Off-Road Diesel Engines

ARB has worked closely with the United States Environmental Protection Agency (U.S. EPA) on developing new PM and NOx standards for engines used in off-road equipment such as backhoes, graders, and farm equipment. U.S EPA has proposed new standards that would reduce the emission from off-road engines to similar levels to the on-road engines discussed above by 2010 – 2012. These new engine standards are expected to become final in 2004. Once approved by U.S. EPA, ARB will adopt these as the applicable state standards for new off-road engines. These standards will reduce diesel PM emission by over 90 percent from new off-road engines currently sold in California.

Cleaner In-Use Diesel Engines

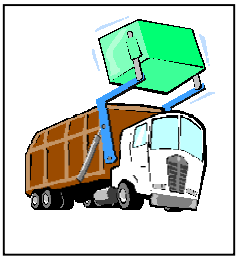
Over the past two years, ARB has developed six new regulations (details in next section) to reduce PM emissions and other pollutants from diesel engines. Another six to eight regulations are planned for adoption over the next two years. These regulations have relied on the following four approaches to significantly reduce emissions from diesel engines:

Replace/Repower – Replace the existing engine with a new diesel engine
Retrofit – Apply an ARB-verified diesel emission control system to the existing engine and fuel system (can include alternative fuels)
Retire the Whole Vehicle – Replacing it with an alternative-fueled vehicle or vehicle with a new, cleaner diesel engine.
Operational Modification – Examples include reduced operating time, reduced idling, or use of electric power

New Regulations for In-Use Diesel Engines

The ARB has adopted several regulations that will reduce diesel emissions from in-use vehicles and engines throughout California. In some cases, the PM reduction strategies also reduce smog-forming emissions such as NOx. These regulations include:

***Waste Collection Trucks** (adopted 2003):* The waste collection vehicle rule offers a variety of strategies that owners must select and apply to each truck in a phased-in schedule from 2004 through 2010 to achieve PM reductions of up to 85 percent. The rule includes compliance flexibility. A key benefit of the rule is the reduction of PM emissions in residential neighborhoods.



***Fleet Rule for Transit Agencies** (adopted 2000):* This regulation cuts NOx and PM emissions from about 10,000 buses operated by transit agencies. The fleet rule for transit agencies moves forward in steps over 10 years, requiring cleaner engines, cleaner fuel, and retrofitting of older buses. Amendments proposed for 2004 will require transit agencies to clean up the buses that had not been covered in the original rule.

***School Bus Idling Restrictions** (adopted 2002):* To reduce the exposure of children to toxic PM emissions, ARB enacted a rule to stop the prolonged idling of diesel school buses and other diesel vehicles near schools. Buses and commercial diesel vehicles are required to turn off their engines after arriving at a school and are allowed to start the engine no more than 30 seconds before departing, unless required for safety or work.

***Stationary Engines** (adopted 2004):* There are approximately 26,000 stationary diesel-fueled engines in California. Most are used as emergency backup in the event of a power failure. Others are used to pump water in agricultural areas, to run compressors, cranes and other equipment. New ARB standards for these engines will bring an approximate 80 percent PM reduction by 2020 through stricter standards for new engines and requirements to retrofit existing engines.

***Transport Refrigeration Units** (adopted 2004):* Transport Refrigeration Units (TRUs) are diesel-powered refrigeration units that cool temperature-sensitive products while they are being shipped in trucks, trailers, shipping containers and rail cars. Although the diesel engines powering TRUs tend to be relatively small, there are about 40,000 of them operating in California. Their PM emissions will be reduced by 65 percent by 2010 and by 92 percent by 2020.

***Portable Engines** (adopted 2004):* California has about 33,000 portable diesel engines used in pumps, airport ground support equipment, oil drilling rigs, generators, and a variety of other equipment. Portable engines emit a total of 4.2 tons per day of diesel PM. The engines also emit about 75 tons per day of smog-forming emissions. ARB's rule requires

stepped reductions in emissions from portable engines, reaching a 95 percent reduction in PM emissions in 2020 with concurrent significant cuts in smog-forming emissions.

Incentive Programs Cleaner Air

In addition to adopted regulations, the ARB has programs in place to provide incentives for owners of higher polluting diesel engines or vehicles to replace that equipment with cleaner, less-polluting equipment. Some of the programs that will reduce diesel PM are:

Carl Moyer Program: The Carl Moyer Program was established in 1999 to offer monetary incentives to reduce NOx emissions from diesel engines. Some of the strategies used to reduce NOx, such as replacing old diesel engines with new alternative-fuel engines, have also resulted in lower PM emissions. The Moyer Program pays vehicle owners to offset the extra cost of reducing NOx emissions below the levels called for by current standards, agreements or regulations. The state has paid about $155 million in Moyer incentives since the Program began, with air district matching funds bringing the total to more than $200 million. The Program's costs for reducing a ton of NOx have averaged less than $5,000 per ton, with the additional benefit of more than 320 tons-per-year of PM reductions.

Lower-Emission School Bus Program: Since 2000, the state and local school districts have allocated more than $70 million to reduce emissions from older, high-polluting school buses. This funding has gone to buy new, cleaner buses and to install filters on existing diesel buses. Thus far, the funding has seen the purchase of about 400 new school buses. Meanwhile, about 40 more new buses are on order and will be delivered to school districts by 2005. The program also will ultimately see 3,000 or more existing buses retrofitted with filters to significantly reduce their emissions.

Compliance Assurance Activities

ARB enforces its rules to ensure that emission benefits are maintained and has programs that assure emission reductions are real. These programs include:

Field Inspection and Testing: ARB regulations require that diesel engines not smoke. ARB has compliance teams that inspect diesel vehicles for excessive smoke and owners are required to perform smoke tests annually on their diesel trucks. Violators face fines and must bring their vehicles into compliance. In addition, we inspect vehicles and engines to ensure our in-use regulations are followed. Once a vehicle or engine is in compliance, it must remain in compliance throughout its life in California.

Retrofit Verification Procedure: One of the options for ARB's new in-use diesel PM reduction rules is reducing PM emissions through the application of ARB-verified diesel emission control strategies to existing engines. Verified control devices such as filters and catalysts or verified fuels can be cost-effective means

to reduce diesel PM from engines. ARB verifies diesel emission control strategies to assure they significantly reduce diesel PM, are durable, and have a mandatory warranty. Owners are required to use only ARB-verified products to ensure the mandated PM reductions are real and durable. ARB works with companies to verify products for those applications where they work best.

What Is Next?

If we are to have cleaner, healthier air as our state continues its rapid population and industrial growth, we must look at every possible action for reducing air pollution. In the years ahead ARB will continue looking for ways to reduce diesel engine PM emissions. Among the actions being considered are:

- Idling Restrictions for On-Road Diesel Trucks
- Requirements for existing stationary agricultural engines
- Rules for publicly-owned equipment and vehicles
- Rules for privately-owned equipment and vehicles
- Harbor craft requirements
- Ocean going vessels requirements
- Cleaner diesel fuel requirements for marine vessels and locomotives
- Reducing PM from cargo handling equipment at ports and shipping yards

For Further Information:

Visit our web site at http://www.arb.ca.gov/diesel/dieselrrp.htm for more information on our actions to reduce diesel PM or call the ARB's Public Information Office at (916) 322-2990.

Further information regarding the various programs and regulations discussed in this fact sheet can be found at:
New Engine Standards: http://www.arb.ca.gov/msprog/onroadhd/onroadhd.htm
Low Sulfur Diesel Fuel: http://www.arb.ca.gov/fuels/diesel/diesel.htm
Waste Collection Trucks: http://www.arb.ca.gov/msprog/SWCV/SWCV.htm
Transit Agency Buses: http://www.arb.ca.gov/msprog/bus/bus.htm
School Bus Idling Restrictions:
http://www.arb.ca.gov/toxics/sbidling/sbidling.htm
Stationary Engines: http://www.arb.ca.gov/regact/statde/statde.htm
Transport Refrigeration Units: http://www.arb.ca.gov/diesel/tru.htm
Portable Engines: http://www.arb.ca.gov/diesel/portdiesel.htm
Lower-Emission School Bus Program:
http://www.arb.ca.gov/msprog/schoolbus/schoolbus.htm
Carl Moyer Program: *http://www.arb.ca.gov/msprog/moyer/moyer.htm*
Verification Procedure: http://www.arb.ca.gov/diesel/verdev/verdev.htm.